

REMARKS

Applicant respectfully requests reconsideration of the present application in view of the foregoing amendments and in view of the reasons that follow.

Status of Claims:

“Withdrawn from consideration” claims 23 and 24 are currently being cancelled.

Claims 1 and 2 are currently being amended.

Claims 31 and 32 are currently being added.

This amendment and reply adds, cancels and amends claims in this application. A detailed listing of all claims that are, or were, in the application, irrespective of whether the claims remain under examination in the application, is presented, with an appropriate defined status identifier.

After adding, canceling and amending the claims as set forth above, claims 1-5, 31 and 32 are now pending in this application for examination on the merits, whereby claims 6-30 were withdrawn from consideration.

Claim Rejections – Prior Art:

In the Office Action, claims 1-3 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Publication No. 2004/0251394 to Rhodes et al.; claim 1 was rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent Publication No. 2002/0036700 to Merrill; and claims 4 and 5 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Rhodes et al. in view of U.S. Patent Publication No. 2002/0021121 to Nakamura. These rejections are traversed with respect to presently pending claims 1-5, for at least the reasons given below.

According to the present invention as recited in the presently pending independent claim 1, there is provided a solid-state imaging device having an integrated array of a plurality of pixels, each pixel comprising:

a photodiode for receiving light and generating photoelectric charges;

a transfer transistor for transferring the photoelectric charges; and

a storage capacitor element coupled to the photodiode at least through the transfer transistor;

the device further having a control signal generator generating at least a control signal for controlling the transfer transistor in such a manner that the transfer transistor passes photoelectric charges overflowing from the photodiode during an accumulating operation;

wherein the storage capacitor accumulates the photoelectric charges overflowing from the photodiode during the accumulating operation.

Thus, according to the presently claimed invention, a storage capacitor accumulates photoelectric charges overflowing from a photodiode during an accumulating operation through a transfer transistor. This feature is not disclosed or suggested by either Rhodes et al. or by Merrill.

In more detail, in Rhodes et al., photoelectric charges are not overflowed from a photodiode (photosensor 12) during an accumulating operation. Consequently, a storage capacitor (in-pixel capacitor 32) is always empty during an accumulating operation.

In Rhodes et al., only the photoelectric charges accumulated in the photodiode (photosensor 12) are transferred to a floating diffusion node (FD 22). Then, the storage transistor 30 is turned on so that the photoelectric charges are accumulated in the floating diffusion node (FD 22) and the storage capacitor (in-pixel capacitor 32).

In Merrill, an active pixel sensor includes an embedded DRAM capacitor that is provided at a gate of an amplifier transistor in the pixel sensor. Figures 6A through 6G of Merrill show examples of an embedded DRAM capacitor, whereby there is no disclosure or suggestion in Merrill for having the DRAM capacitor accumulate photoelectric charges overflowing from a photodiode during an accumulating operation through a transfer transistor.

As discussed above, since neither Rhodes et al. nor Merrill discloses or suggests a storage capacitor that accumulates photoelectric charges overflowing from a photodiode during an accumulating operation through a transfer transistor, presently pending independent claim 1 is not anticipated by either of these two references, and whereby Nakamura does not rectify these deficiencies of Rhodes et al. and Merrill.

Furthermore, with respect to the rejection of claim 2, the feature that was asserted to be a functional limitation is now explicitly recited as a feature of a storage transistor, and whereby such feature is not disclosed or suggested by either Rhodes et al. or by Merrill.

Conclusion:

Since all of the issues raised in the Office Action have been addressed in this Amendment and Reply, Applicant believes that the present application is now in condition for allowance, and an early indication of allowance is respectfully requested.

The Examiner is invited to contact the undersigned by telephone if it is felt that a telephone interview would advance the prosecution of the present application.

The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicant hereby petitions for such extension under 37 C.F.R. §1.136 and authorizes payment of any such extensions fees to Deposit Account No. 19-0741.

Respectfully submitted,

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